REMARKS

In the last Office Action, the Examiner rejected claims 1-2 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,523,283 to Sueshige et al. ("Sueshige"). Additional art was cited of interest.

In accordance with the present response, the specification has been suitably revised to provide literal basis for the amended claim language and to bring it into better conformance with U.S. practice. Original claims 1-2 have been amended in formal respects to improve the wording and bring them into better conformance with U.S. practice. New claims 3-20 have been added to provide a fuller scope of coverage. A new abstract which more clearly reflects the invention to which the amended and new claims are directed has been substituted for the original abstract.

Applicants request reconsideration of their application in light of the following discussion.

Brief Summary of the Invention

The present invention is directed to an overload prevention device for a snow removing vehicle.

Conventional snow removing machines are known which clear snow by transmitting power from an engine to a rotational auger. As described in the specification (pgs. 1-2), during a snow removing operation with the conventional

snow removing machines, the auger oftentimes bites into a lump of ice or a stone causing the auger to stop rotating. This causes an excessive load to act on the power train from the engine to the auger.

Several types of the foregoing conventional snow removing machines incorporate a detector for detecting an excessive load acting on the power train from the engine to the auger. However, when an overload is detected, if the engine is stopped by instantaneous overloads occurring at times such as when the auger hits a curbstone or the like, or if the engine is stopped by noise from the detector, optimal overload detection and prevention cannot be achieved. Stated otherwise, the detectors of the conventional snow removing machines have not been able to effectively distinguish between instantaneous overloading occurring when the auger hits a curbstone or the like and erroneous overloading caused by detector noise from continuous overloading caused by the auger biting into snow or debris.

The present invention overcomes the drawbacks of the conventional art. Figs. 1-22 show an embodiment of an overload prevention device 60 for a snow removing machine 10 according to the present invention embodied in the claims. The overload prevention device 60 forms part of an auger transmission 18 of the snow removing machine 10 and prevents

an excessive load from acting on a power train of the auger transmission 18 which transmits power from the engine 15 to an auger 23 and an auger shaft 22 of the snow removing machine 10.

The overload prevention device 60 has a worm wheel 38 (e.g., first rotational member) meshing with a worm 37 formed on an input shaft 36 of the auger transmission 18. The worm wheel 38 has protrusions 83 formed at a side surface thereof. A cylindrical member 41 (e.g., second rotational member) is integrally connected to the auger shaft 22 and engages with the worm wheel 38 for rotation therewith over a predetermined torque range and for rotation relative thereto when a predetermined torque is exceeded. A generally disk-shaped member 45 (e.g., movable member) is disposed adjacent to the worm wheel 38 for restricting a rotating angle of the cylindrical member 41. The disk-shaped member 45 has a plurality of generally disk-shaped protuberances 93 facing the protrusions 83 of the worm wheel 38. A detector 53 outputs a detection signal each time the detector detects movement of the disk-shaped member 45 away from the side surface of the worm wheel 38 when the protuberances 93 of the disk-shaped member 45 ride on the protrusions 83 of the worm wheel 38 responsive to rotation of the cylindrical member 41 and the worm wheel 38 relative to one another. A control unit stops

operation of the engine 15 when the detector 53 outputs the detection signal a preselected number of times within a preselected time period.

Thus the overload protection device according to the present invention incorporates a control unit which stops the engine when the number of times the detector outputs the detection signal reaches a preselected number of times within a preselected time period. By this structure and function, instantaneous overloads occurring when the auger hits a curbstone or the like can be accurately and efficiently distinguished from continuous overloading caused by the auger biting into snow or debris during a snow removing operation, thereby improving the operational efficiency of the snow removing machine.

Traversal of Prior Art Rejection

Claims 1-2 were rejected under 35 U.S.C. §102(e) as being anticipated by Sueshige. Applicants respectfully traverse this rejection and submit that amended claims 1-2 recite subject matter which is not identically disclosed or described in Sueshige.

Amended independent claim 1 is directed to an overload prevention device for an auger transmission of a snow removing machine and for preventing an excessive load from

acting on a power train of the auger transmission from an engine to an auger and an auger shaft of the snow removing machine. The overload prevention device recited in claim 1 comprises a worm wheel meshing with a worm formed on an input shaft of the auger transmission, the worm wheel having a plurality of wheel protrusions formed at a side surface thereof, a cylindrical member integrally connected to the auger shaft and engaging with the worm wheel for rotation therewith over a predetermined torque range and for rotation relative thereto when a predetermined torque is exceeded, a generally disk-shaped member disposed adjacent to the worm wheel for restricting a rotating angle of the cylindrical member, the disk-shaped member having a plurality of generally disk-shaped protuberances facing the wheel protrusions of the worm wheel, a detector for outputting a detection signal each time the detector detects movement of the disk-shaped member away from the side surface of the worm wheel when the protuberances of the disk-shaped member ride on the wheel protrusions of the worm wheel responsive to rotation of the cylindrical member and the worm wheel relative to one another, and a control unit for stopping operation of the engine when the detector outputs the detection signal a preselected number of times within a preselected time period. No corresponding structural and functional combination is disclosed or described by Sueshige.

Sueshige discloses an overload protection mechanism 60 for a snow removing machine (Figs. 1-7). The overload protection mechanism 60 includes several components corresponding to those of the overload prevention device recited in claim 1, including a worm wheel 38, a cylindrical member 41, a disk-shaped member 45, and a detector 53.

However, Sueshige does not disclose or describe the control unit recited in amended independent claim 1. More specifically, Sueshige does not disclose or describe a control unit for stopping operation of the engine when the detector outputs the detection signal a preselected number of times within a preselected time period, as recited in amended independent claim 1. In Sueshige, the engine is stopped when the detector 53 (i.e., a washer detection switch) operates upon forced displacement of a movable element 76 thereof (col. 6, lines 1-8). Sueshige does not disclose any means for stopping operation of the engine when the detector outputs the detection signal a preselected number of times within a preselected time period, as recited in amended independent claim 1. Thus Sueshige suffers from the drawbacks of conventional overload protecting devices which are not capable of distinguishing instantaneous overloads occurring when the auger hits a curbstone or the like from continuous overloading caused by the auger biting into snow or debris during a snow removing operation.

In the absence of the foregoing disclosure recited in amended independent claim 1, anticipation cannot be found. See, e.g., W.L. Gore & Associates v. Garlock, Inc., 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) ("Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration"); Continental Can Co. USA v. Monsanto Co., 20 USPQ2d 1746, 1748 (Fed. Cir. 1991) ("When more than one reference is required to establish unpatentability of the claimed invention anticipation under § 102 can not be found"); Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 221 USPQ 481, 485 (Fed. Cir. 1984) (emphasis added) ("Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim").

Stated otherwise, there must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention. This standard is clearly not satisfied by Sueshige for the reasons stated above. Furthermore, Sueshige does not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify Sueshige's overload protection mechanism to arrive at the claimed invention.

Claim 2 depends on and contains all of the limitations of amended independent claim 1 and, therefore, distinguishes from Sueshige at least in the same manner as claim 1.

Moreover, there is a separate ground for patentability of amended dependent claim 2 which includes the additional limitation that each of the wheel protrusions of the worm wheel has a top portion having a planar surface extending in a direction generally perpendicular to an axis of rotation of the worm wheel. No corresponding structure is disclosed or suggested by the prior art of record. For example, as shown in Figs. 9A-9B of Sueshige, protruding segments 64 of the worm wheel 38 only have surfaces which do not extend in a direction generally perpendicular to an axis of rotation of the worm wheel 38 (i.e., the surfaces of the protruding segments extend in directions other than 90 degrees relative to the axis of rotation of the worm wheel 38).

In view of the foregoing, applicants respectfully request the rejection of claims 1-2 under 35 U.S.C. §102(e) as being clearly anticipated by Sueshige be withdrawn.

Applicants respectfully submit that newly added claims 3-20 also patentably distinguish from the prior art of record.

Claims 3-9 depend on and contain all of the limitations of amended independent claim 1 and, therefore, distinguish from Sueshige at least in the same manner as claim 1.

Moreover, there are separate grounds for patentability of several of new dependent claims 3-9.

Claim 3 is directed to the specific structure of the protuberances of the disk-shaped member and to their structural relationship with the planar surfaces of the top portions of the wheel protrusions. No corresponding structural features are disclosed or suggested by the prior art of record.

Claims 5-9 are directed to the specific structure of the control means (claim 5) and the structure and operation of the stopper member (claims 6-9). No corresponding structural and functional combinations are disclosed or suggested by the prior art of record.

New independent claim 10 is directed to a snow removing machine having an engine, an auger, and an auger transmission for transmitting power from the engine to the auger in combination with an overload prevention device for preventing an excessive load on the auger transmission. Claim 10 requires that the overload prevention device has a first rotational member drivingly engaged with an input shaft of the

auger transmission, the first rotational member having a plurality of protrusions formed at a surface thereof, a second rotational member engaging the first rotational member for rotation therewith over a predetermined torque range and for rotation relative thereto when a predetermined torque is exceeded, a movable member mounted adjacent to the first rotational member for undergoing movement to restrict a rotating angle of the second rotational member, the movable member having a plurality of protuberances for engagement with the protrusions of the first rotational member, a detector for outputting a detection signal each time the detector detects movement of the movable member in a direction away from the first rotational member when the protuberances of the movable member engage the protrusions of the first rotational member responsive to rotation of the second rotational member and the first rotational member relative to one another, and a control unit for stopping operation of the engine when the detector outputs the detection signal a preselected number of times within a preselected time period. No corresponding structural and functional combination is disclosed or suggested by the prior art of record as set forth above for amended independent claim 1.

Claims 11-20 depend on and contain all of the limitations of independent claim 10 and, therefore, distinguish from Sueshige at least in the same manner as claim 10.

Moreover, there are separate grounds for patentability of several of new dependent claims 11-20 which are directed to the structure of the protrusions of the first rotational member (claim 11), the protuberances of the movable member (claim 12), the control means (claim 14), and the stopper member (claims 15-18). No corresponding structure is disclosed or suggested by the prior art of record.

In view of the foregoing amendments and discussion, the application is believed to be in allowable form. Accordingly, favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

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